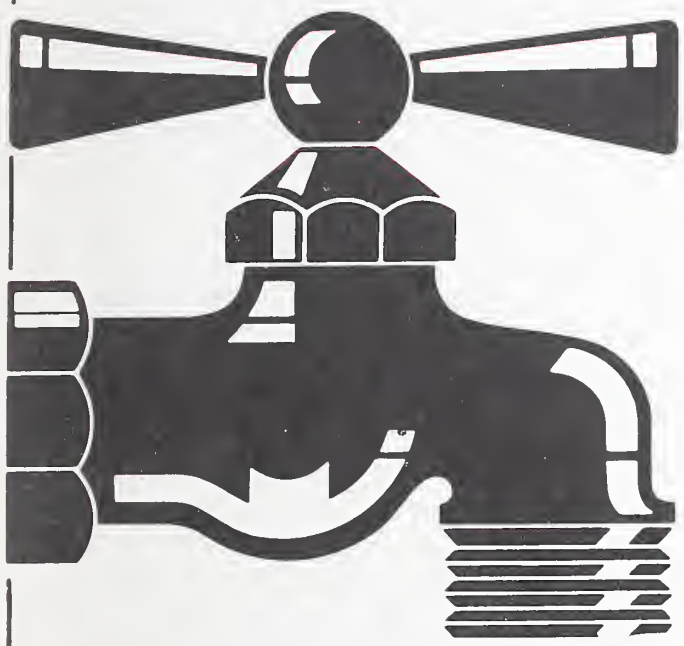
DFSC

FUEL LINE

4th QUARTER, 1981



PETROLEUM LOSSES

PREVENTING MONEY FROM GOING DOWN THE DRAIN

DFSC FUEL LINE

A DEFENSE FUEL SUPPLY CENTER
TECHNICAL PUBLICATION

4TH QUARTER 1981

FUEL LINE is an official technical publication, published quarterly by and for Defense Fuel Supply Center and fuel-oriented clientele. FUEL LINE is designed to provide timely, factual information on policies, plans, operations and technical developments of Defense Fuel Supply Center and other interrelated subject matter. Views and opinions expressed in the FUEL LINE are not necessarily those of the Department of Defense. All inquiries should be addressed to: Defense Fuel Supply Center, Editor, FUEL LINE, Public Affairs Office (AP), Cameron Station, Alexandria, Virginia, 22314. Telephone: (202) 274-6489.

Major photographic services are supplied by Defense Logistics Agency, Administrative Support Center, Technical Presentations Division.

RADM W. J. Ryan, SC, USN
Commander, Defense Fuel Supply Center

CAPT O. W. Hamilton, Jr., SC, USN
Deputy Commander, Defense Fuel Supply Center

Thomas J. Gelli
Public Affairs Officer

Denise M. Gower
Editor

ARTICLES

DFAMS Implementation Plans Proceed

by Dan Frazier

It has been some time since an overview of the status of the implementation of the Defense Fuel Automated Management System (DFAMS) was disseminated. This article serves to describe actions already taken as well as those that are forthcoming.

The DFAMS was developed in response to a need for integrated fuel management information and a more timely and accurate financial system. The objective of DFAMS is the implementation of a DOD-wide automated system that will serve needs at all levels of fuel management and facilitate timely, accurate and complete Military Standard Petroleum System (MILSPETS) transaction reporting by all activities, worldwide.

Activities which are or will become part of the system are:

- All Defense Fuel Support Points (DFSPs) holding DLA-owned product.
- Defense Fuel Regions (DFRs) that order product from a contractor against an active DLA contract, issue redistribution orders/release orders, or submit (or monitor submission of) MILSPETS transactions to DFSC.
- Service or agency activities designated by their headquarters as intermediate control points for the submission of MILSPETS transactions to DFSC.

DFSC has established timeliness and accuracy/completeness goals for the fully implemented system. Transactions are to be reported to DFSC within two work days after they occur and corrected within 24 hours after receipt of an error notice. The accuracy/completeness goal calls for all DFSP transactions for any given month to be recorded and reconciled with end-of-month physical inventories no later than the sixth calendar day of the following month. This will enable DFSC to provide timely and accurate financial reports to DLA and DOD.

MILSPETS Transaction Reporting

The following is the status of the implementation of MILSPETS transaction reporting as of 1 October 1981.

- Of 81 CONUS DFSPs, all but six Service-managed (Government-owned Government-operated) accounts and nine contractor-operated DFSPs and pipeline terminals were reporting through their respective DFR. By the end of 1981, the monthly Bulk Petroleum Terminal Report (RCS:DLA(M)1883 (DFSC)) hard copy reporting is expected to be eliminated for most CONUS contractor-operated DFSPs and pipeline terminals.
- Of 93 overseas DFSPs, nine are reporting via Automatic Digital Network (AUTODIN) on a test basis. Results show that AUTODIN can support DFAMS for overseas DFSPs. DFSC is optimistic that with mutual Service commitment, all overseas DFSPs can be reporting by 1 July 1982 and that the hard copy reporting of the monthly Bulk Petroleum Terminal Report can be eliminated for these nine reporting DFSPs in the near future.
- Service retail activities are now coding documents with new MILSPETS codes and data elements. MILSPETS transaction reporting by these activities is expected to be implemented by 1 July 1982, concurrent with implementation of reporting by the remaining Service-managed DFSPs.
- *Procedures for Management of Petroleum Products* (DoD 4140.25-M (DRAFT)) provides MILSPETS/DFAMS procedures for document coding and preparation, transaction reporting, and monthly reconciliation by Service-managed DFSPs. DFSC plans to maintain these procedures in draft form until the majority of Service-managed DFSPs are satisfactorily reporting, and then obtain approval through

Military Standard (MILS) channels for formal publication. The *DFAMS Users Manual* (DFSCM 4730.2-working copy), which contains procedures for DFSC and the DFRs, will also be maintained in draft form until DFAMS is operating satisfactorily.

Planned Actions for CONUS

Implementation of the DFAMS on-line Distribution Plan Authorization/Source Identification and Ordering Authorization (DPA/SIOATH) for CONUS DFRs is planned for late 1981 or early 1982 on a phased schedule. DFSC representatives will visit each DFR to provide training.

The DFAMS Active Contract Status Report, which is now being reviewed, should be ready for operational use by DFSC and the DFRs very soon.

Priority attention is also being given to the DFSP Monthly Inventory Status Report with hopes of having it ready for operational use by January 1982. The Monthly Inventory Status Report will replace the Management Operation Bulk Petroleum Terminal Report following the implementation of the re-reconciliation capability and the elimination of inventory status hard copy reporting by CONUS DFSPs. The DFSP Inventory Status Inquiry that is now provided to CONUS DFSPs will be reviewed and revised to align data and format with the DFSP Monthly Inventory Status Report. DFSC hopes to have this document available soon after release of the monthly report.

DFSC is also working on a capability to provide an automated DD Form 1155 for processed P10 Delivery Order/Amendment transactions.

Early in 1982, one or two contractor-operated DFSPs in each CONUS region will be selected to test new standard MILSPETS forms. These forms will replace multiple forms such as the Requisition and Invoice/Shipping Document (DD1149) and the DOD Single Line Item Release Receipt Document (DD 1348-1). DFRs will be asked to help make the selections and participate in the tests.

Overseas Telecommunications

Early in the DFAMS development, AUTODIN was identified as the most cost-effective available telecommunications system for support of MILSPETS transaction reporting by overseas activities. While AUTODIN is not as efficient as the reporting method used by CONUS DFRs (direct input to DFSC via a remote terminal), experience with other MILS systems and DFSC testing have shown that AUTODIN should be able to support DFAMS adequately.

The Defense Automatic Addressing System (DAAS) routes all MILSPETS transactions from the initiator to DFSC and all DFSC rejects and management notices back to the initiator or reporting activity. To minimize turnaround time, certain edits have been incorporated into the system for DFSC,

Figure 1. Reject and management notice transactions

DIC	Generated by	Purpose
P_X	DAAS	Returns invalid transaction for correction/re-submission; enhances timeliness of correction/re-submission.
P_Z	DFAMS	Returns invalid transaction for correction/re-submission.
P6R	DFAMS	Advises that transaction has been accepted/recorded in DFAMS (AUTODIN equivalent of Transaction Register).
P6B	DFAMS	Advises that a specific transaction is missing; enhances timeliness of reconciliation.
P6D	DFAMS	Advises that a reconciliation cannot be accomplished due to: (1) Missing physical inventory transaction (2) Missing transaction(s) (3) Out of tolerance condition.

enabling the system to immediately return erroneous transactions to the initiator for correction and re-submission. MILSPETS transactions are easily recognized by Document Identifier Codes P1 through P9 (cc 1-3) and by Content Indicator Code "IHPZ" in all header cards.

Once a reporting activity establishes itself with the local communications center as an official AUTODIN subscriber for submission of MILSPETS transactions, a major segment of the communications link has been completed. Once transactions are entered in AUTODIN, they are received by the Cameron Station communications terminal within minutes. Each evening the transactions are automatically entered into the DFSC computer for DFAMS processing.

The reject and management notice transactions shown in the figure have been developed to provide needed AUTODIN feedback to the reporting activity.

The weakest links in AUTODIN reporting are conceded to be:

- Delays in relay of data to the designated intermediate control point from multiple operating terminals not having ready access to AUTODIN. These terminals may require telecopier or other enhancements.
- Delays in keypunching, transaction verification, and input to AUTODIN. (The local data processing office and Communications Center may be contacted for assistance and support.)
- Delays caused by the return of erroneous transactions to the initiator for correction and re-submission.
- Mail delays affecting DFAMS output reports provided to activities.

DFSC is sensitive to unique local situations and problems that may be encountered by overseas activities and it will support special needs to the extent practicable. All available means will be utilized to achieve the same results as we achieved in CONUS.

FL

DAN FRAZIER is the Chief of the Management Support Office of the Directorate of Supply Operations.

Giving Credit Where It Is Due

by Rosalind Thomas

The U.S. Government National Credit Card (Standard Form 149) is issued by the General Services Administration for use by operators of Government vehicles, small airplanes, and boats. A variety of fuels and services and some minor emergency repairs may be purchased with the card.

Prior to 1957, the Government operators used credit cards issued by the major oil companies for these purchases. However, problems arose from the difficulty of controlling the use of the cards. To combat this, the Government began issuing its own credit card.

Major oil companies, independent operators, and individual service stations can contract through the DFSC Ground Fuels Division to become authorized sources under this program. Currently, these contracts run for one year and are renewable annually at the Government's option up to four times. During this five-year period the solicitation closes on a quarterly calendar basis, at which time new companies may submit offers. In responding to the Request for Proposals, bidders specify the fuels and services they wish to provide and the states in which they wish to sell them. Additionally, they may stipulate any discount they wish to offer.

When all awards have been made, DFSC issues the Government Vehicle Operator's Guide (DFSCH 4280.1), sized to fit the glove compartment of a car. This guide lists by state all companies that are authorized sources under the credit-card program. Companies that offer discounts are listed first under each state heading and are bold-faced in order to encourage patronage. On a local basis, activities may make arrangements with service stations for discounts even greater than those cited in the guide.

Companies desiring more information about this program may contact the Ground Fuels Division of the DFSC Directorate of Contracting and Production.

FL

ROSALIND THOMAS was a procurement agent in the Ground Fuels Division of the DFSC Directorate of Contracting and Production. She recently joined the Naval Air Operational Support Field Group in Arlington, Virginia as a contract specialist.

Curbing Wholesale Petroleum Losses

by Major Terry Arnholt (USAF)

Losses in the wholesale-petroleum arena add up to a significant number of dollars. Certainly, as the price of petroleum increases so will the magnitude of the losses. In an attempt to stem these losses and tighten the management of fuel operations, the Defense Fuel Supply Center and the oil industry have begun to initiate reforms in the area of allowable loss tolerances.

Kenneth F. Weaver, writing in the February 1981 National Geographic Special Report on Energy, stated:

> Virtually every proposal for adding to our energy supply involves hidden cost, unpleasant side effects, and uncertainties. Study after study reaches the same conclusion: The cleanest, least expensive, and least vulnerable energy option today is to use less by being more efficient.[1]

The Defense Fuel Supply Center would like to improve its energy efficiency by reducing wholesale losses. The criticality of this becomes highly evident when one considers that the cost of fuel to DFSC has increased roughly sixfold since 1973 although the number of barrels purchased has dropped about 40 percent (see Figure 1).

DOD's 1980 wholesale-product losses (0.30 percent of the total amount of fuel handled), although within the present DFSC/Industry allowable loss tolerance (0.50 percent of the total amount of fuel handled), amounted to a very significant dollar/barrel figure. Clearly, there are some variances in what is considered acceptable loss tolerance. The oil industry presently accepts a loss factor of 0.10 percent of the throughput for pipelines, 0.50 percent of the total amount of product loaded on tankers and barges, and 0.50 percent of inventory plus receipts for storage. However, industry is now rethinking its present loss policy and some companies, as a cost-savings initiative, are already employing computers to track losses by individual ships and terminals.

Loss tolerances similar to those presently adopted by industry are prescribed in DOD Directive 4140.25-M, *Procedures for the Management of Petroleum Products*. However, DOD is also rethinking its loss-tolerance limits. Research done by the Stock Control Division of the DFSC Directorate of Supply Operations strongly indicates that activities tend to manage up or down to allowable tolerances. This is evidenced by the fact that the Stock Control Division receives numerous DD Forms 250-1 and DD Forms 1788 reporting loss of 0.48 percent and 0.49 percent, but very few reporting 0.51 or 0.52 percent. The data collected by the Stock Control Division reflect a loss curve that is clearly skewed to the left to the 0.50-percent loss tolerance. This seems to suggest that activities are able to manage losses predicated upon their dislike for filling out Discrepancy in Shipment Reports.

The Stock Control Division is examining a proposal for reducing the loss tolerances prescribed in Paragraph 209.4.4 of DOD Directive 4140.25-M (see Figure 2). It is believed that a considerable savings can be achieved by reducing the present tolerances, that the savings will be worth the effort, and that reduced tolerances are congruous with efforts to maximize energy efficiency.

The Stock Control Division has begun tracking losses at Defense Fuel Support Points. The goal is to identify those terminals that consistently have above-average losses. Once these terminals have been identified, the Stock Control Division will work with the Defense Fuel Regions and with the terminal operators to identify the root causes of excessive losses, and will offer suggestions for reducing them. The division plans to eventually design a computer program that routinely tracks terminal losses and

[1] *Kenneth F. Weaver, "Our Energy Predicament,"* National Geographic Special Report on Energy, *February 1981, p. 19.*

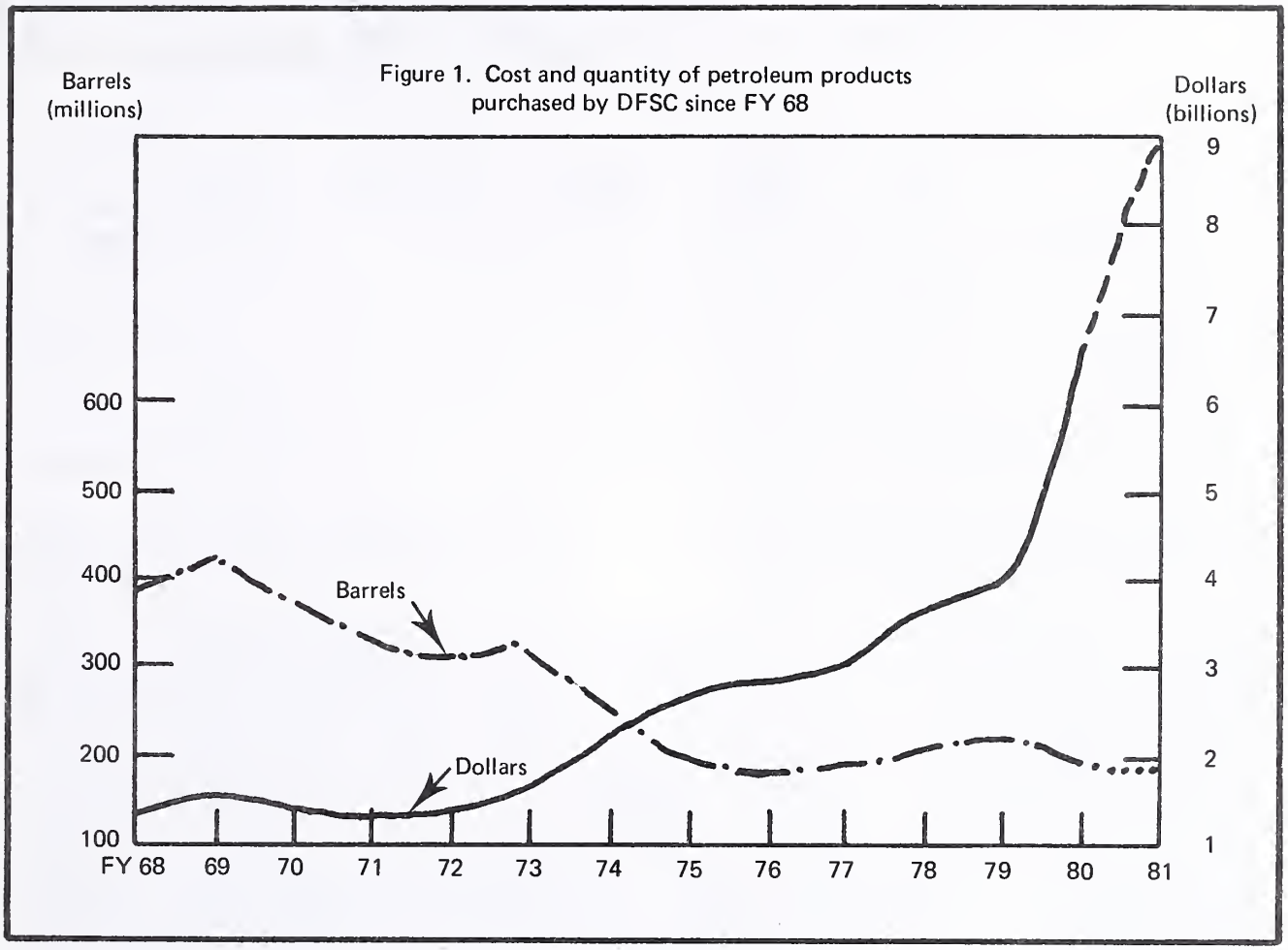


Figure 1. Cost and quantity of petroleum products purchased by DFSC since FY 68

individual ocean-tanker losses.

What then, can be done in the field now to help reduce losses? Probably the most important and least costly management initiative would be to encourage and foster increased attention to detail in gauging and reporting. Careful gauging, temperature reading, conversion-table reading, and computing are critical to the accurate maintenance of records. Reports issued by the Defense Logistics Agency Inspector General continue to cite examples of thermometers that have not been calibrated and operators who use improper gauging equipment and poor gauging procedures. Through effective management, these problems can be prevented at minimum cost to the Government.

Proper maintenance also cannot be overemphasized. A leak at the rate of two drops per second over one year results in a loss of more than 1,350 gallons.[2] The breathing loss of a tank is really a function of its physical condition. For example, a tank that has a gas-tight roof, a gas-tight manhole and gauging hatch, and that is properly equipped with a pressure vacuum vent will have a very negligible breathing loss; however, a tank with a leaky roof, a leaky gauge hatch, a leaky manhole cover, and an open vent, will have a considerable loss over a short period of time.

Also necessary and of great importance are proper operating procedures. The breathing loss for a tank that is one-quarter full is double what it is when the same tank is three-quarters full.[3] Filling loss occurs when liquid is pumped into the tank and displaces the air-vapor mixture in the vapor space above the liquid. The filling loss varies in volume, depending on the concentration of the vapors in the vapor space. This concentration is determined in part by the way the tank operator performs his tasks. In simpler words, the longer the interval of time between pumpings, the

[2] *Military Handbook 201B, Conservation of Petroleum Products, September 1971, p. 87.*
[3] *Ibid, p. 86.*

Figure 2. Current and proposed loss-tolerance percentage for various types of fuel (current loss tolerances are as prescribed in DoD Directive 4140.25-M)

	Tanker		Barge		Pipeline		Tank Car/ Tank Truck		Storage	
									current	proposed
AVGAS/MOGAS	.5	.4	.5	.3	.5	.1	.5	.1	.5	.4
JP-4	.5	.4	.5	.3	.5	.1	.5	.1	.5	.4
JP-5 and JP-8	.5	.4	.5	.3	.5	.1	.5	.1	.5	.4
Distillates	.5	.4	.5	.3	.5	.1	.5	.1	.25	.25
Residuals	.5	.4	.5	.3	.5	.1	.5	.1	.25	.25

greater the concentration of the vapors in the vapor space of the tank. Therefore, shorter standing periods between pumpings will produce lower concentrations, and accordingly, the vapor filling loss can be minimized.

Storing volatile fuels such as Jet Fuel, Avgas, and Mogas in the proper type of tank is very important. Volatile fuels should be stored in tanks that reduce vapor loss by either reducing the vapor space in the tank (with floating roof or floating pan) or by properly recycling the vapors. Activities that are currently storing volatile fuels in a fixed-roof tank may want to determine how much fuel could be saved if a floating pan or some type of vapor-recovery system were installed. Military Standard 140B, *Procedure for Determining Normal Loss Expectancies for Petroleum Liquids*, contains detailed guidance for calculating vapor losses for floating-roof tanks and fixed-roof tanks.[4] The engineers in the Terminal Management Division of the DFSC Directorate of Supply Operations are available to provide technical aid in calculating the economics of various vapor-recovery systems. Comparisons of the evaporation losses of fixed-roof tanks and floating-roof tanks are contained in the *Compilation of Air Pollutant Emission Factors* issued by the U.S. Environmental Protection Agency.

Probably the most important single ingredient in loss prevention is *a proper attitude*. Fuel is money and should be accorded the same respect that bankers accord money in their vaults. Management should highlight losses, attempt to discover the root causes, and devise loss-control initiatives wherever financially possible. History shows that increased management attention can curtail losses, and the Defense Fuel Supply Center plans to pursue all possible means of loss reduction. In the final analysis, though, the success of any loss-reduction program or initiative hinges on the efforts of personnel in the field. **FL**

> "The Defense Fuel Supply Center would like to improve its energy efficiency by reducing wholesale losses. The criticality of this becomes highly evident when one considers that the cost of fuel to DFSC has increased roughly sixfold since 1973 although the number of barrels purchased has dropped about 40 percent."

[4] *Military Standard 140B*, Military Standard Procedure for Determining Normal Loss Expectancies for Petroleum Liquids, *December 1978, pp. 4-12.*

MAJOR TERRY ARNHOLT, USAF is the chief of the Stock Control Division of the Directorate of Supply Operations.

Synfuels Plant Completes Successful Pilot Run

An experimental synthetic fuel plant which converted high-sulfur coal to oil was recently shut down voluntarily by the operators after successful completion of an 11-month test.

The 3900 hours of testing on Illinois high-sulfur coal at the Exxon Donor Solvent pilot plant in Baytown, Texas, was the first phase of plant test operations. Testing on two additional types of coal is scheduled for the next 12 months. The project has been carried out by private industry and partially funded by the Federal government.

It is hoped that the success of this testing program will spur the private sector to assess the commercial potential for coal liquefaction and encourage it to assume the dominant role in completing development of this new technology.

Since full-scale operations of the coal-liquefaction pilot plant began in June 1980, about 39,000 tons of bituminous coal—nearly 400 railroad carloads—have been processed at the plant to produce a liquid substitute for conventional crude oil.

The Exxon Donor Solvent process, originated by Exxon Research and Engineering Co., is one of several still in the development stage that achieves increased efficiency by dissolving coal directly by using heat and pressure and adding hydrogen. Today's state-of-the-art technology typically relies on a less efficient, indirect process consisting of gasifying the coal first, and then recombining the gases into liquids.

To carry out the Donor Solvent process, high-sulfur coal is mixed with hydrogen at temperatures of

COAL CONVERSION—This Donor Solvent coal liquefaction pilot plant at Baytown, Texas converts 250 tons of high-sulfur coal per day to oil.

800-880 degrees Fahrenheit and pressures from 1500-2500 pounds per square inch which cause the coal to begin to dissolve. Hydrogen is supplied both as a gas and as a solvent made from the coal. A catalyst is used to speed the addition of hydrogen, but is kept in a separate vessel. Solvent, circulating through the vessel, picks up hydrogen atoms, then passes into the main liquefaction reactor where it transfers, or "donates," the hydrogen to the dissolved coal—hence the name "donor solvent." The technology builds on experience gained in petroleum refining and has the advantage of not exposing the catalyst to the harsh constituents of coal.

At maximum capacity, the Baytown pilot plant can process 250 tons of coal a day. A full-sized plant would process as much as 30,000 tons of coal per day, converting each ton into roughly 2.5 barrels of oil. Indirect liquefaction technology being proposed today for the first U.S. synfuel plants will probably manufacture less than 2 barrels of oil from each ton of coal.

With the series of tests completed on Illinois coal, attention will now focus on a western, low-sulfur coal. Engineers and technicians expect to spend several weeks preparing the plant to process Wyodak subbituminous coal from Wyoming.

The Department of Energy and the seven industrial sponsors have agreed to continue the project into FY 82 to complete tests on the western coal plus a third coal, a Texas lignite.

Meeting in Washington, D.C. last spring, the sponsors agreed to a new total cost of the project estimated at $346.5 million, down from the originally anticipated costs of $367 million. Retained in the revised program will be the $314.5 million base liquefaction effort, which involves continued operation of the pilot plant.

The sponsors agreed, however, to restructure the part of the program intended to evaluate ways of processing coal-liquefaction residues, or *bottoms,* from the process. The new program will move away from large-scale development of FLEXICOKINGSM—a technique that would produce additional liquids from the residue—and toward a less costly program involving evaluation and testing of several alternative approaches to processing residue.

The revised approach is part of an ancillary program that features greater attention to toxicology and that is expected to cost at least $23 million.

In addition to Exxon, the industrial partners in the project are: the Electric Power Research Institute; the Japan Coal Liquefaction Development Co.; Phillips Coal Co.; ARCO Coal Co.; the German firm of Ruhrkohe A.G.; and the Italian firm, AGIP, S.p.A.

FL

New Rules Proposed For Priority Contracts

The Commerce Department's Office of Industrial Mobilization has proposed several changes to the rules governing the priority that must be given to Defense contracts and to projects in support of Government energy programs. Preferential treatment for certain Government contracts is mandated by the Defense Production Act of 1950.

A Government project designated as an authorized program by the Federal Emergency Management Agency qualifies for a rating which obligates contractors and suppliers to treat the project preferentially if told to do so by the Government. Among projects that qualify for ratings are those involving military-aircraft production, civil-defense activities, nuclear-defense projects, and programs intended to "maximize domestic energy supplies."

While most of the revisions are aimed at consolidating and simplifying existing regulations, there are three changes that significantly alter existing ones.

One proposed change would allow contractors to combine rated and unrated orders in order to make bulk purchases and increase efficiency. However, contractors would be obligated to specify which portion of an order is rated, and suppliers would be required to give preference to that portion only.

Another proposed change would authorize suppliers to reject a rated order if the contractor had not obtained the item from them for a period of two years. But the contractor could sidestep this if he could show he had not ordered the item from any other source for two years or that he would be unable to procure the item from his regular supplier in time.

The third revision would allow a Government contractor to assign rated orders for items prior to actually receiving the contract. However, the Office of Industrial Mobilization would not authorize the advance order unless it had assurance from the Government that the contractor would indeed receive the work. This provision was added because of the time lag that can occur in a project funded on a yearly basis by Congress.

An unscrupulous contractor who assigned ratings to orders not related to defense or energy needs could gain tremendous advantage in the marketplace. For this reason, penalties for doing so are set by law at $10,000 fine or one year in jail, or both.

FL

Ellsworth AFB Personnel Witness JP–4 Refining

by Dick Doll

Personnel from the Fuels Management Branch of Ellsworth AFB, Rapid City, South Dakota recently toured the Wyoming Refining Company at Newcastle, Wyoming. Led by the petroleum quality assurance specialist from the Defense Contract Administration Services Management Area Denver and company personnel, the tour highlighted the complete refining process leading to the production of JP-4 which is provided to Ellsworth AFB.

The Ellsworth AFB laboratory supervisor and the chief of the Fuels Management Branch found the demonstrations of JP-4 testing especially interesting. The system of testing for compliance with specification requirements on individual tank blends was outlined by the quality assurance specialist and the plant chemist. The testing of JP-4 samples taken from individual truck shipments was observed.

Explanations were given about the phases of the blending process and in-process stream testing. In addition, demonstrations and explanations of the methods used to maintain the quality of a product during storage and during the loading and shipping phases of delivery were given.

Historically, Ellsworth AFB has received JP-4 shipments from several locations via tank truck, rail, and pipeline. For many years, though, the nearest and largest supplier in terms of quantity has been the Wyoming Refining Company at Newcastle. Shipments of JP-4 from this refinery via tank truck in quantities of approximately 10,000 gallons each are made to Ellsworth AFB on an average of 18 times a day.

A meeting of contractor personnel involved with the performance of the DFSC contract, the personnel of the Ellsworth AFB Fuels Management Branch, and the petroleum quality assurance specialist proved highly beneficial. **FL**

DICK DOLL is the petroleum quality assurance specialist from the Defense Contract Administration Services Management Area-Denver.

Bulk Petroleum Storage

Various amounts of contractor-owned contractor-operated tankage have been placed under service contract/Foreign Government agreement for wholesale bulk petroleum. The following are some of the more significant awards:

NAME:	LOCATION	PRODUCT	QUANTITY (MBBLS)
Killingholme	UK	JP5	451
		DFM	491
Essex (Purfleet)	UK	JP5	267
		DFM	559
Ebrach	Germany	DF2	30
Copenhagen	Denmark	JP5	582
		DFM	579
South Shields	UK	JP5	184
Rotterdam	Netherlands	JP4	603
Killingholme	UK	JP4	459
Hamburg	Germany	JP4	500
Ghent	Belgium	JP4	1,318
Essex (W. Thurrock)	UK	JP4	495
Backford South	UK	JP8	238
Wervin	UK	JP8	176
Plumley	UK	JP8/4	566

Technology Takes a Dive

The deep world of the seabed, normally free of the turbulence which so often makes surface operations of offshore petroleum exploration and production unpleasant, is a new frontier for technological innovation.

Pressed by the growing needs of oilfield development in the North Sea and North Atlantic, British scientists and engineers are developing some concepts which make a latter-day Atlantis a little less fanciful. For example, the United Kingdom National Engineering Laboratory is producing practical devices from the realms of science fiction. One is the *Seabug* series of robot underwater tractors that are powered by hydrostatic drives. Connected to an electrical umbilical line from the surface, the *Seabug* has an enclosed electric motor which pressurizes oil which in turn drives pistons to rotate the four wheels. The *Seabug's* tilting axles allow the remotely controlled tractor to traverse rough seabed as it inspects pipelines for faults.

While tractors and submersibles (miniature submarines) are complementary, each being able to undertake tasks the other cannot, the tractor boasts advantages over the submersible for a number of deep-sea jobs. When performing inspection tasks, for example, *Seabugs* can look under pipelines where they bridge depressions in the seabed, an important feature because that is where pipelines often fail and crack. *Seabugs* can provide considerable power that can be tapped from their four motors at the wheel hubs while the vehicles are stationary. They can provide much more pulling effort than can a floating submersible. And unlike submersibles. they can be left unattended and parked on the seabed between jobs. Moreover, a *Seabug* needs only one man to operate it, whereas it takes a minimum crew of two and sometimes three to operate a submersible.

Seabug is already at work, but another of the laboratory's projects, *Armadillo,* is just a detailed design study. It seems likely though that the first *Armadillo* soon will be under construction. In an artist's conception, *Armadillo* resembles an enormous mechanical spider crawling over the sides of tankers or oil platforms.

In the center is a platform that supports television cameras and the apparatus used to spray the special paint that can be applied under water. Protruding from the center are girders carrying several sets of armor-plated, magnetic caterpillar tracks, which permit *Armadillo* to cling and crawl over the hulls it paints.

Like *Seabug, Armadillo* is to be powered by hydrostatic motors that use oil as a working fluid. But future versions of both *Seabug* and *Armadillo* will almost certainly be powered by the sea-water motor, which may be the most important innovation in underwater engineering in the last decade. *Seabug* has shown that the hydrostatic motor driven by fluid under pressure is an ideal power plant for deep-sea use. But the use of oil, the usual working fluid, raises problems.

Leakages of the high-pressure oil inevitably occur, clouding the vision of the divers and the image projected by the remotely controlled television cameras. It also makes the tools handled by divers slippery and hard to use. The alternative is to try to use seawater as the working fluid. In addition to eliminating pollution problems this approach would obviate the need for a pressurized umbilical from the surface. The working fluid can be drawn from and returned to the surrounding sea.

Being non-lubricating and highly corrosive, seawater as a working fluid is an engineer's nightmare. But the working life of a deep-sea hydrostatic motor need not be long, provided it is guaranteed to be effective. Development of self-lubricating materials and corrosion-resistant alloys, together with that of motors with a minimum of moving parts to cause friction, has now reached the point where commercial users are for the first time seriously interested in building these motors.

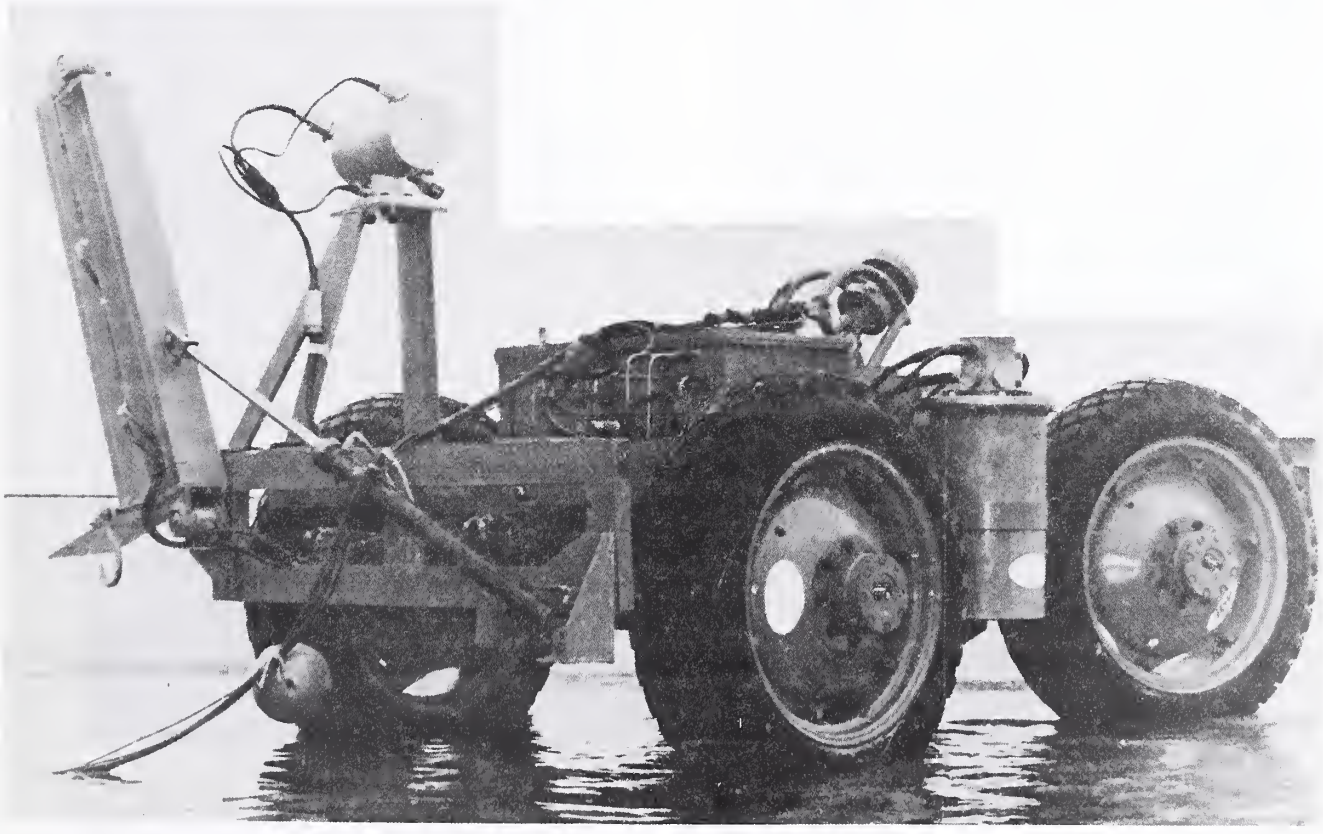
One of the latest water motors has recently been sent to the American Civil Engineering Laboratory in California for joint testing by the U.S. and Royal Navies. Indeed, some of the first practical applications for the motors seem bound to be in underwater military equipment. This should help spur the development of the motors to the point where they are

"One of the latest water motors has recently been sent to the American Civil Engineering Laboratory in California for joint testing by the U.S. and Royal Navies. Indeed, some of the first practical applications for the motors seem bound to be in underwater military equipment."

available for civil applications.

The main problem in the sea-water motor lies in prolonging the lives of the moving parts, including the pistons driven by the pressurized water. The pistons can now be guaranteed to have a continuous, flat-out working life of around 50 hours. Though short compared with the normal working lives of a conventional motor's components, these periods are long enough to interest potential users because of the advantages of using sea-water motors at great depth. In addition to obviating the risks already mentioned, they eliminate the need for elaborate seals and the risk of explosions.

A very different but, in terms of safety, equally important development in underwater technology for offshore platforms has to do with anchoring them to the seabed. Production oil and gas rigs are anchored with piles driven some hundred meters down into the sea floor, and fastened to the platforms with thousands of tons of grout, a cement mixture. In the Nuclear Physics Division of the U.K. Government's Harwell laboratories, scientists have developed a technique that uses radioisotopes to ensure that the anchoring process has been properly completed. Already used on three platforms in the North Sea, and shortly to be used in setting up new platforms, the isotope technique helps prevent insecure anchoring and subsequent platform collapse.



BEACHED—A *Seabug* is shown on land.

"Pressed by the growing needs of oilfield development in the North Sea and North Atlantic, British scientists and engineers are developing some concepts which make a latter-day Atlantis a little less fanciful. For example, the United Kingdom National Engineering Laboratory is producing practical devices from the realms of science fiction."

Huge quantities of cement are used in two ways to fasten rigs to the seabed. The spaces surrounding the piles, driven nearly two hundred meters into the seabed, are filled with grout. The steel platform of the rig itself stands on tubes which fit over the piles, and the spaces between the tubes and the piles are also filled with grout. In both cases, the grout is pumped in from the bottom and fills the spaces around the piles, displacing sea water as it goes.

UNDERWATER—This artist's sketch of *Armadillo* shows the design concept for a machine which could clean and paint tanker hulls underwater or undertake maintenance on oil platforms out at sea. It would use armor-plated magnetic tracks to provide traction.

If the water is clear, a diver can be stationed at the top of a pile to check that the grout has completely filled up the space around the pile. But if the water is cloudy, or the surface seas rough, divers cannot be used. And divers can never see what is going on around the piles stuck down into the seabed.

What is needed is something that will travel up with the grout rising around the piles, registering its level as it goes and indicating if the grout is leaking away. The Harwell team's technique uses radioisotopes to follow grout movements. The technique is basically quite simple. A radioisotope, Scandium 46, is mixed into the grout and gives off radiation which is picked up by detectors mounted inside the hollow piles or affixed outside them. The detectors follow the upward movement of isotope with the grout.

Tests have already shown that the isotope techniques are safer and more accurate than visual inspection by divers, with the added advantage that they can be used year round and in all weather conditions.

With such developments already well advanced, it may not seem so surprising that oil men are already planning to take the last step down to the seabed, where they are preparing to place both platform and crew. Another British engineering firm has designed an undersea oil production system and facility called *Subseamac One*. It features living quarters that are three stories high and rest upon the tops of the oil storage tanks. Thick metal walls neutralize the pressure of the sea and allow a crew of roughly 20 to live comfortably in a modernistic underwater colony.

Reprinted with permission from *Petroleum Gazette*.

Guarding Against Delivery Spills

by Judy Olonovich

Earlier this year, a fuel spill occurred during a delivery of JP-4 from a commercial pipeline dock on the intracoastal waterway to storage tankage at Myrtle Beach AFB, South Carolina. An investigation of the incident revealed the spill was caused by a separated weld on the vertical seam of an air eliminator.

Subsequently, officials from Myrtle Beach AFB, the DFSC, the Defense Contract Administration Service, the Defense Fuel Region Southeast, and the pipeline company drew up a bilateral agreement that provides detailed operating procedures to safeguard operations and reduce the possibility of a future spill at that location. These safeguards include—

- the employment of an additional contractor employee who will ensure that there is one person on the dock and one person at the terminal during all transfer operations.
- the suspension of the use of the air-eliminator system.
- the initiation of a procedure for checking and rechecking to ensure that all valves are properly aligned and tagged before transfer operations begin.
- the installation of a communication hot line with attendant testing procedures that ensure its effective operation during transfer operations.
- the establishment of definitive operating procedures that clearly specify which parties are responsible for particular functions during transfer operations and that outline techniques for immediately discovering any malfunction.

The incident near Myrtle Beach clearly highlights the need to maintain close surveillance over pipeline transfer operations. Moreover, it points up a need to implement operating procedures that minimize the possibility of human error caused by neglect or oversight. The DFSC is carefully reviewing all pipeline operating agreements to see if any weaknesses that could lead to a similar situation exist. Perhaps above all, it is imperative that the pipeline company and the customer strive to maintain a close working relationship, for it is the customer who will be the first to know when a problem exists. **FL**

JUDY OLONOVICH is a traffic management specialist for the Transportation Division of the Directorate of Supply Operations.

SEAM SPLITTING—This separated weld on an air eliminator near Myrtle Beach AFB caused a spill of JP-4 during delivery operations. The incident led to the establishment of safeguards to reduce the possibility of future spills there.

Fuel Storage That's Worth Its Salt

by William J. Riley

No one, not even a commercial oil company, has to store finished petroleum products for long periods as the Department of Defense is required to. In its role as peacekeeper, the U.S. military must have fuel on hand, and not have to go looking for it when the need arises.

However, the stability of finished products such as diesel fuel, gasoline, and turbine fuels is finite. Exposure to the atmosphere causes the products to oxidize and deteriorate. This deterioration appears as insoluble solid material such as gums and sludges that can precipitate costly repairs to engines and cause a blockage of the flow of fuel in the delicate system of a jet aircraft. Consequently, DOD is always on the search for the ideal place to store fuel.

The ideal location for pre-positioned fuel would be at the refinery where product is usually bought so that it could be turned over every time a new cargo was picked up. But in order for DFSC to get the best buy on fuel, it must shop around. Long-term storage requirements cannot influence what is going to be paid for fuel to support day-to-day operations.

Any fuel storage utilized must be secure, require little or no maintenance, and have a large enough capacity to be cost-effective. In addition, it must maintain the integrity of the product by preventing contamination from rust, scale, water, or some other product.

DFSC now has a facility that meets all these requirements. It is a new Defense Fuel Support Point (DFSP) located a few miles east of Liverpool in the United Kingdom at Plumley. The Plumley DFSP, a salt cavity, is located some 750 feet underground. No maintenance is required because the bulkheads (walls) and overhead (ceiling) are made of salt, which prevents the accumulation of rust and scale. If water should get into the product, a prospect that is not likely, it is absorbed by the salt. The cavities are large, each with a capacity of more than 550,000 barrels. It would seem that something this good, particularly in this day and time, would have to be expensive. This storage, however, costs about one-fifth the cost of conventional storage.

The Plumley DFSC is located at a United Kingdom government site that has 34 cavities in the Cheshire salt deposits. These cavities were constructed to hold the U.K. Petroleum National Reserves, which are similar to our Strategic Petroleum Reserve. They have an average product capacity of 90,000 cubic meters, or 556,000 barrels each, and were constructed between 1951 and 1955 by leaching out the brine. They were enlarged during the period of 1956 through 1963. Of the 34 cavities, 20 are used for crude-oil storage. The remaining 14 cavities hold refined oil products such as motor gasoline, diesel fuel, and kerosene.

The filling and emptying of the cavities are achieved by displacing the product with saturated brine (salt) solution. The solution is prepared and controlled by a local chemical company. If the water in the solution is not saturated with the salt, it will absorb the salt, thus eroding the cavity. The maximum delivery rate for refined oil going into the cavities is approximately 15,000 cubic meters per

"The stability of finished products such as diesel fuel, gasoline, and turbine fuels is finite. Consequently, DOD is always on the search for the ideal place to store fuel."

day, based on the maximum return brine rate acceptable to the chemical company. Similarly, the maximum rate of removing product from storage is related to the available supply of brine, and is controlled by an agreement that limits it to 7,200 cubic meters per day. In an emergency, the lift-out rate can be as high as 13,000 cubic meters per day or 3,000 barrels an hour. Product from the cavity goes by pipeline to DFSP Backford South. The product is then moved by the main pipeline for use in the U.K. or taken to a port for backloading onto a tanker for delivery to a location determined by the DFSC Directorate of Supply Operations.

Another notable feature of the salt cavity storage is the process by which a sample is drawn. Unlike earlier days when a bottle was dropped down 750 feet and reeled up, today the brine must be prepared and product displaced as when product is pumped out. However, there is no need to continuously turn the product over or to sample as often as with conventional storage. Stored in the salt cavity, the product is under pressure and unexposed to the outside atmosphere as it is in conventional storage. As noted earlier, exposure oxidizes the product, causing it to deteriorate. Tests run by the Air Force Laboratory at Mildenhall have confirmed that product stored in the salt cavity for over seven years is in substantially the same condition as when it was put in.

Measurements of product volumes delivered and drawn out could be a problem. One can't open the manhole, climb in the tank, and take the measurements necessary to formulate calibration tables. With salt cavity storage, volume is determined by pumping product through temperature-compensating turbine meters. While it may be difficult with this method to tell if all product has been pumped, and while complete emptying of a cavity cannot be guaranteed because of the possibility of the presence or cracks or fissures in the cavity roof which might trap product, review of the records on product moved in and out has indicated that the cavities strip very well. In every case, the loss of product was less than one-half of one percent, with the norm being significantly smaller. That record matches those of DFSC's conventional facilities.

While this storage may not be perfect, it is better than most conventional storage and the price is right. It is estimated that more than $500,000 will be saved annually on stock rotation by using the salt cavity storage. The product is not exposed to atmosphere and thus will not deteriorate in the cavity storage. More than $1 million will be saved annually by using the cavity rather than conventional storage. **FL**

"While this storage may not be perfect, it is better than most conventional storage and the price is right. It is estimated that more than $500,000 will be saved annually on stock rotation by using the salt cavity storage."

William J. Riley is the Chief of the Quality Assurance Division of the Directorate of Technical Operations. He formerly served as the Director of Fuels for Headquarters Third Air Force-Europe.

Out-of-Service Tankage

by Les Long

The DFSC Directorate of Supply Operations is requesting that greater care be taken in completing the Bulk Message Report RCS: DLA (W) 1884 (DFSC-MIN) (MILSPETS) which is submitted weekly for all terminals holding DLA bulk petroleum stocks (see sample report format). Currently, 43 activities report data for 171 terminals. Guidance for completing the report is contained in Appendix 2-9C, DOD 4140.25-M.

Section I of the report, its major portion, is used by inventory managers to coordinate tanker cargo schedules and to conduct inventory management analyses and briefings. Information from the reports is also used to answer inquiries from all levels of the Federal Government.

Section II is to be reported by ocean terminals only

BULK PETROLEUM MESSAGE REPORT FORMAT
(MILSPETS)

FROM: Submitting Activity & DoDAAC Code

TO: DFSC-OB

INFO: JPO, Service HQ

UNCLASSIFIED

Bulk Petroleum Terminal Message Report, RCS (DLA(W)1884(DFSC)).

As of 0800, Day/Mo/Yr (NAME & PHONE NUMBER OF INDIVIDUAL PREPARING REPORT) TERMINAL ALPHA DoDAAC AB0001.

SECTION I INVENTORY DATA

A	B	C	D	E	F	G	H	I	J	K
JP4	410	136	230	650	885	700	500	800	600	230
JP5	180	30	190	495	500	200	200	210	0	225
DFM	50	50	50	136	175	175	00	0	0	50

SECTION II TANKER DATA

A	B	C	D	E	F	G	H
JP4	C0891	FN LDY	149	JP4	C0920	EG TSP	210
JP4	C0892	BR TEN	125	DFM	R0691	BAR JN	103
JP5	C0891	FN LDY	150				

SECTION III REMARKS

A. One 25M DFM tank to be converted to JP5 service during March still included in DFM storage.
B. Cross-country pipeline fill JP4 100M Rbls.

and should reflect the products, cargo numbers, vessel names, and quantities discharged since the previous report. Additionally, it should report products, cargo numbers, vessel names, and quantities in port awaiting discharge or in the process of discharging.

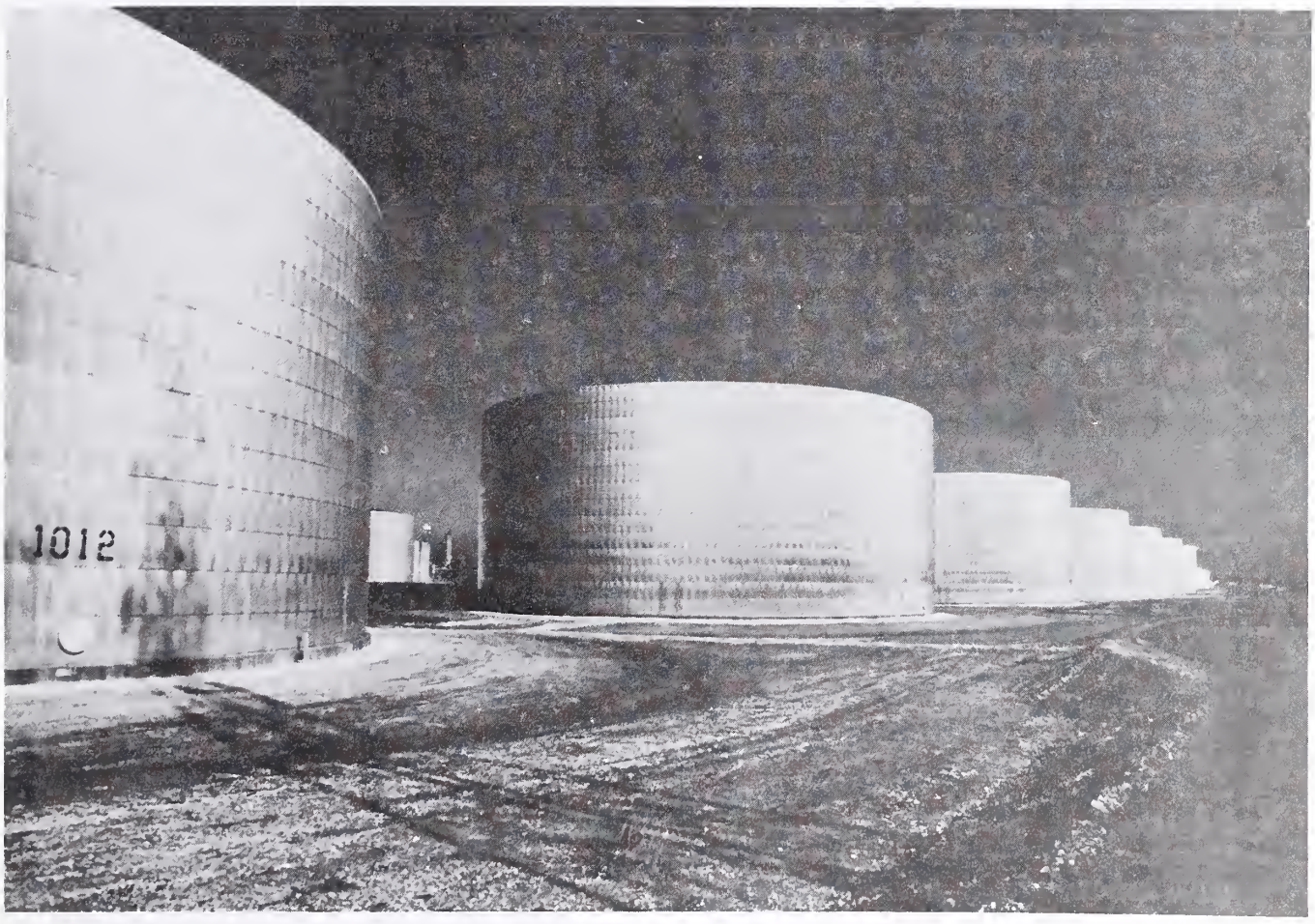
Section III, the *Remarks* section of the report, is equally important. Entries in this section should clarify the entries in Section I and reflect bulk petroleum storage capabilities. The facilities distribution specialist in charge of maintaining statistics on out-of-service tanks, conversions, and new tanks, relies on the statements made in this section

From column F of Section I, the specialist determines how many thousands of barrels of product the terminal is capable of storing. Total capacity is determined by deducting the unusable space at the top of the tank and structural losses from the known shell capacity. Each time a tank is placed in or removed from service, it becomes imperative that column F reflect the change.

When new tankage capabilities are entered in column F, the tank number, shell capacity, unusable space, tank bottom quantities, and manifold quantities for each new tank should be reflected in Section III. This information is used in conjunction with the Bulk Petroleum Storage Facilities Report (DD-M (A) 506) and the Inventory Management Plan.

FL

LES LONG recently retired from the DFSC Directorate of Supply Operations.



OUT OF SERVICE?—It is imperative that out-of-service tankage be reported so that the facilities distribution specialist has an accurate accounting of storage capabilities.

Inline Blending In the Antilles

by John D. Childers

At the Shell refinery on the island of Curacao in the Netherlands Antilles an innovative process is employed to blend product for DFSC cargoes. Called inline blending, the process involves blending the product as it is loaded into the vessel, which, in effect, becomes the batch tank. Currently this method is used to blend JP-4, MOGAS, and DFM at the refinery.

Inline blending poses more problems for the Quality Assurance Representative (QAR) than does the familiar batch-blending method used at most refineries. When product is batch-blended, the QAR ensures the product is *on-specification* in the batch tank and that it is placed aboard the vessel in the same condition. During the inline-blending process, the QAR must be sure that the product is blended and loaded *on-specification* simultaneously.

To begin a typical inline-blending process, the QAR must first witness the sampling of the component tanks to be used for the blend, checking the samples for homogeneity and appearance. This can take some time, as an average of five to six component tanks may be needed to blend MOGAS or DFM even if the amount to be loaded is a relatively small parcel of 20- or 30-thousand barrels.

If the product in the component tanks is found to be properly mixed, clean, and bright, a hand blend of the components and of any required additives is made. This blend is then tested against specifications, and, if necessary, is adjusted until it meets all requirements.

It is at this point that the blending process is ready to begin. The blending system is activated with the infusion of all the components and additives. The end item is pumped to the jetty and through a loading-and-return loop back to a wash tank. The line is then sampled and tested to ensure that it complies with specifications and conforms with the test results of the hand blend. This is the first time the QAR is able to see what the actual finished product is like, so he is prepared for surprises. If the product is *off-specification,* as can happen when an additive pump or blend controller stops functioning, the entire system must be checked out and the process repeated.

Once the product is *on-specification* and the component tanks have been gauged, the loading is ready to begin. Up to this point, the only product that has been blended and *on-specification* is the line fill. Because the rest will be blended as it is loaded, the product on the vessel must be sampled and tested at intervals to ensure that the system is operating properly.

If the product goes *off-specification* during the loading, the QAR must employ one of two methods to

WHAT IT TAKES—Products from component tanks at Shell Curacao are piped through the manifolding leading to the dock area where the separate components become a finished product on the ship.

remedy it. If a problem is found in the system, it can be repaired and the blend appropriately adjusted to compensate for the condition. The second method calls for discharging the loaded cargo and starting over.

Once the loading is completed, the product on the ship is sampled and tested for homogeneity and conformance to specification. If the results match those of the hand blend and show that the blend is homogeneous, the vessel is released. If this is not the case, full specification tests, which can be a time-consuming process, must be run on the ship's composite or on each of its systems.

As would be done with a batch-blended loading, the vessel and component tanks are gauged after loading. However, with inline blending there are usually more tanks to be gauged, often as many as 15 or 20 shore tanks if two or three grades of product were loaded.

Because it does not engage tanks and systems for long periods for batch blending of products to U.S. Government specifications, an inline-blending system is advantageous to the contractor. Using inline blending, the contractor, once the component tanks have been gauged off and released, can begin loading another ship with a commercial cargo from the same tanks.

The disadvantage is that many more things can go wrong during an inline-blending loading than with a batch-blending system. Because of this, a special inline-blending clause is included in DFSC's contract with Shell Curacao. The clause addresses ship-shore differences in quantity and the point at which DFSC accepts the product.

FL

JOHN D. CHILDERS is chief of the Defense Fuel Quality Assurance Region Curacao.

The Spanish Connection

Last year, the Fuel Department at the U.S. Naval Station at Rota, Spain handled more than 25 million barrels of petroleum, making it one of the Navy's most active fuel terminals. Rota's Fuel Department serves as a central petroleum receiving and distribution point for U.S. armed forces as well as for Spanish forces and Spain's national oil company, CAMPSA.

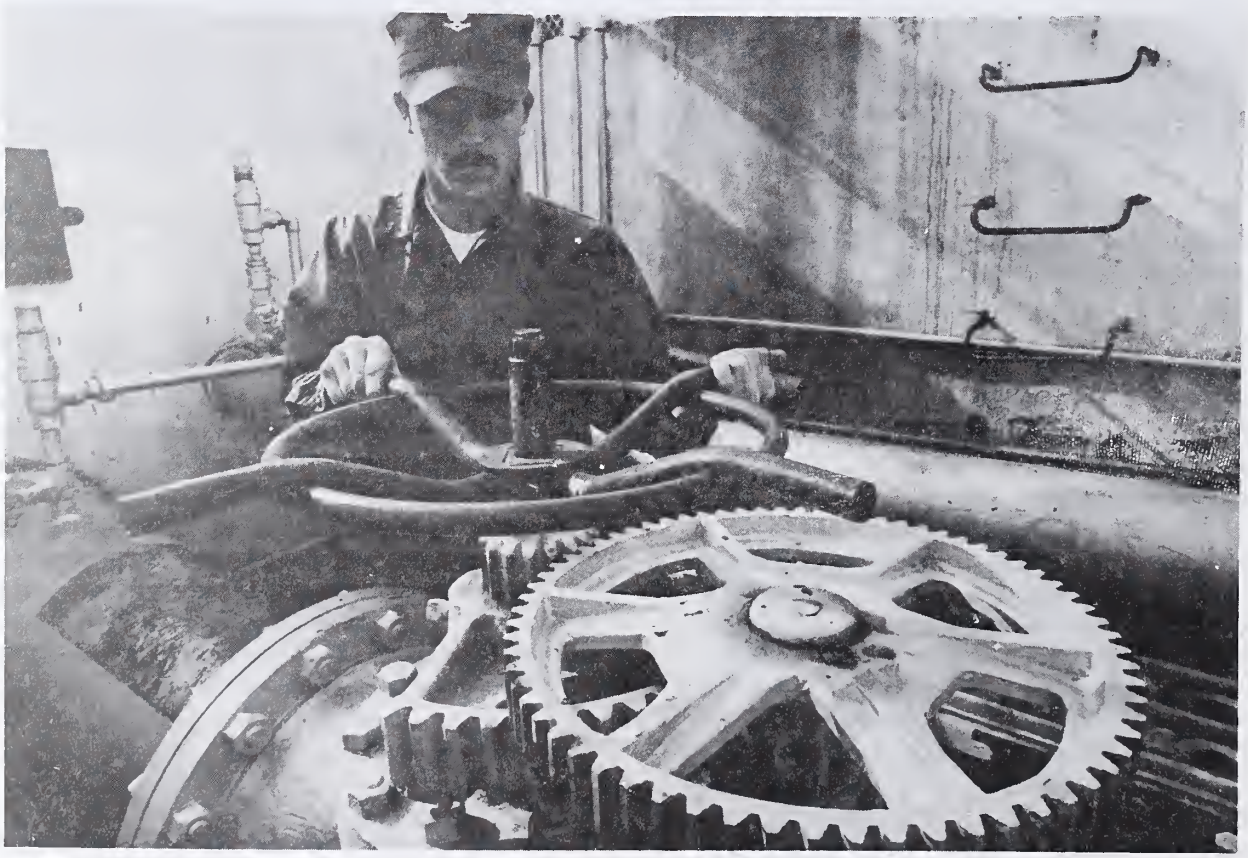
Although a substantial portion of the petroleum received at the Rota terminal is destined for CAMPSA facilities, the terminal's primary mission is support of the Navy's Sixth Fleet and U.S. forces in the Mediterranean area. Interestingly, a significant part of their business involves JP-4 aviation fuel, which is pumped by pipeline from Rota to air bases in Torrejon and Zaragoza.

Of course, the greatest part of the Fuel Department's workload, and the one demanding the most from its personnel, is that of supporting the Sixth Fleet. As is the case at many Naval Stations, fleet turnovers at Rota create an especially frenetic pace and dictate an around-the-clock effort. An amphibious turnover, for example, can require 40 hours of continuous pumping, which means personnel work long hours with only intermittent rest.

And completion of a turnover does not necessarily mean a work slowdown. The Rota terminal is a convenient and frequently used refueling point for fleet units passing through the area. Even a ship that comes in for refueling at 0200 hours will be issued fuel and on her way that same morning.

The Rota terminal has a storage capacity of 1,300,000 barrels, which compared to other Navy storage facilities is of modest size, making the volume of work done there all the more noteworthy.

FL



TURNING POINT—Opening a valve at the Rota storage facility, a Navy utilitiesman allows fuel to flow to pier-side lines. (Photo by Dan Ormsby)

Plans Are Made For Fuel Pier Facility

by Fadhil Khattat

Last December, the Defense Fuel Supply Center, in cooperation with Naval Facilities Engineering Command, Western Division (NAVGAC WEST DIV), began siting a modern fuel pier facility in Southern California. If approved, the project may receive approximately $35 million from the Office of the Assistant Secretary of Defense in FY 83 under the Military Construction Authorization Program. The facility will be constructed at the Navy Mole, a property of the Terminal Island Naval Station at Long Beach.

The facility's design calls for a 900-foot-long pier which will support DOD activities on the West Coast and U.S. Naval vessels. Supporting facilities will include four pipelines for shipping to and receiving from Defense Fuel Support Point storage tanks in San Pedro, operating tanks, pumps, manifold systems, fire-fighting equipment, and a deballast water reclamation plant. This plant will be constructed to avert possible oil pollution from transfer operations and hydrocarbon emissions from storage and transfer vessels.

The Environmental Impact Statement (EIS) and a preliminary design package for the project are currently being prepared with completion for both expected this year. The EIS, required by the National Environmental Policy Act of 1969 (NEPA), is being prepared by Atlantis Scientific, a Beverly Hills environmental engineering firm under contract with NAVFAC WEST DIV. Several Federal, state, and local agencies are providing input for this document. The U.S. Army Corps of Engineers, Los Angeles District; the Harbor Department of the City of Los Angeles; and the U.S. Navy are serving as cooperating agencies. The Corps of Engineers is involved because of its jurisdiction to issue a permit to construct the pier in a navigable waterway. The City of Los Angeles will issue a permit to construct pipelines on city-approved right of ways, and the U.S. Navy will support the design effort and supervise the preparation of the EIS. DFSC's role will continue to be coordination of all aspects of the planning phase of this project until it is submitted to OASD for military construction authorization.

The draft EIS was completed in September 1981. DFSC and DLA have reviewed the document to ensure that it complies with the National Environmental Policy Act; DOD Directive 6050.1, *Environmental Effects in the U.S. of DOD Actions;* and DLAR 1000.22, *Environmental Considerations in DLA Actions*. When it is completed, the final EIS will then be sent to the Environmental Protection Agency and circulated among other Federal agencies for review and comment and announced to the public in the *Federal Register*. **FL**

Until recently, MR. FADHIL KHATTAT was an ecologist in the DFSC Environmental Control Office. He is now employed as an Environmental Quality Specialist with the U.S. Department of Interior, Bureau of Indian Affairs.

Deepsteam Oil Recovery Project Moves Into Underground Testing

Scientists have lowered an innovative steam generator almost half a mile underground near Long Beach, Cal., in an attempt to tap "heavy" oil that is too deep for conventional recovery.

The advanced research and development effort is part of "Project Deepstream," an effort begun by the U.S. Department of Energy in 1978 and carried out by Sandia Laboratories of Albuquerque, N.M.

The project is aimed at improving current techniques in which steam is generated at the surface, then pumped underground to thin the molasses-like heavy crude, making it easier to recover. This technique, however, works only in relatively shallow wells, typically less than 2,000 feet deep. Below that, where more than 1.6-billion barrels of recoverable oil may exist, surface-generated steam cools too much to be effective.

By lowering the specially designed DEEPSTEAM generator to the bottom of the well, researchers hope to avoid the heat losses encountered using surface methods.

Following experiments last year in a shallow oil

field near Bakersfield, Cal., the Sandia technicians began the first deep tests of the system after lowering it nearly 2,500 feet below the Long Beach waterfront. The tube-shaped steam generator is six inches in diameter and 40 inches long. It is designed to burn air and diesel fuel pumped from the surface. Water, also pumped from the surface, is heated to steam which is injected into the reservoir at pressures of 1,300 to 1,500 pounds per square inch.

Concurrently with the underground test, a second prototype system will run on the surface with oxygen substituted for air.

Both systems are fully automated on the surface. Air compressors, regulating valves, pumps, flow meters, connections and instrumentation all are controlled by a central computer. Researchers are monitoring the progress of the test from display screens at the computer consoles.

In full operation, approximately 30 gallons of diesel fuel will be burned each hour by the underground system to produce 4,000 pounds of steam. If all goes as planned, the downhole test is expected to confirm that less fuel is burned for each barrel of oil produced when the steam is generated at the bottom of the well rather than on the surface. Conventional systems typically burn at least one barrel of oil for every three barrels produced. Downhole systems, on an equivalent basis, are expected to use only two-thirds as much fuel.

Also, by keeping the particulates and combustion gases underground, the downhole generator is also expected to significantly reduce environmental emissions.

The first test is scheduled to last four months, after which scientists will compare the performance of the air and oxygen generators to determine which is more effective. The one chosen will be lowered into the well for an additional eight months of testing.

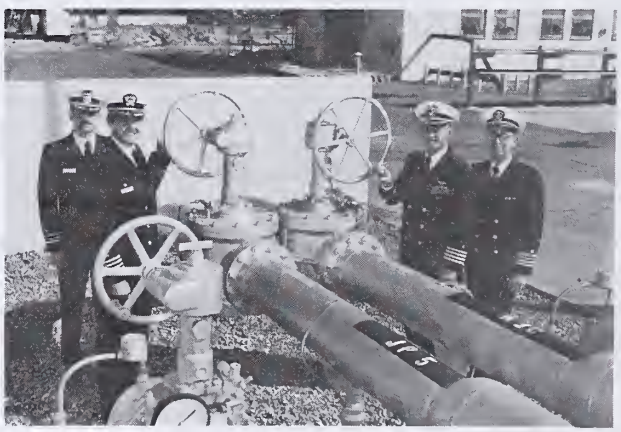
It is believed that the DEEPSTEAM technique may be effective to depths of a mile. **FL**

Pipeline Dedicated in San Diego

A recently dedicated pipeline at the Naval Supply Center, San Diego Fuel Annex at Point Loma now links the Fuel Annex with Naval Air Station (NAS) North Island 3800 feet away. Two 10-inch pipes, one for jet fuel and the other for diesel fuel marine, were laid 25 feet below the San Diego Bay channel.

Construction on the project began in April 1979 and included the construction of a new pump station at the fuel annex and a booster pump station at the NAS North Island that will transfer the fuels to the quay wall to fuel the ships. The project also included the building of containment facilities in potential oil-spill sites. In addition, 13 issue tanks at the fuel annex were equipped with high-level alarms. Auxiliary features include flow metering, cleaning systems, and fueling stations.

The San Diego Fuel Annex provides fuel to homeported ships located in San Diego, the 32nd Street Naval Station, and the Naval Air Stations at North Island and Miramar. Fuel has been transported to NAS Miramar via pipeline since 1954, but movement of fuel for NAS North Island across the Bay had been by barges and yard oilers. In recent years, increased fuel requirements, coupled with concern over safety and pollution hazards associated with these barge movements, dictated the need for direct pipelines between the Point Loma Fuel Annex and NAS North Island. **FL**



TURNING ON THE PUMPS—Captain Phillip McCall (left), Commanding Officer of the Naval Supply Center, and Rear Admiral Warren Aut, Commanding Officer of NAS North Island, open a new pipeline at the San Diego Fuel Annex. Also taking part in the ceremony were Commander Chip Lovett (left rear) and Captain Robert Frampton.

Using Local Market Sources

by Marianne Behm

Activities whose ground fuel requirements are pending, that is those requirements for which DFSC is unable to obtain contract coverage under Post, Camp and Station Regional Contract Bulletins, must utilize local purchase procedures to buy fuel on the open market. However, this can increase the administrative workload of the activity and can create serious budget problems, since high fuel prices often make it difficult for the activity to stay within its established small-purchase fund limitations.

When there is a shortage of fuel, such as when crude-oil production is curtailed, DFSC is sometimes unable to contract for an activity's total requirements. When this happens, local purchases and other ad hoc methods are employed to obtain as much coverage as possible. In these instances, local-market source data provided by field activities to the Directorate of Supply Operations are of tremendous assistance.

At other times, requirements may remain uncovered simply because responses to solicitations for product delivery to a specific location are not received. Local suppliers may be unfamiliar with DFSC contracting procedures and unaware of the importance of being on the DFSC Bidder's Mailing List. Prospective bidders who are on the list receive copies of solicitations, and thereby have the opportunity to submit bids for those locations they are interested in and capable of supporting.

Activities are encouraged to continue to provide local-purchase data together with their requirements submission to DFSC. The name, address, and phone number of each supplier from which fuel is being purchased under local-purchase procedures should be included. These suppliers will be contacted and their interest in becoming a DFSC contractor and in being placed on the Bidder's Mailing List will be encouraged. Continued assistance from field activities in identifying prospective contractors will enable DFSC to maintain a current Bidder's Mailing List and ensure the best possible contract coverage. **FL**

MARIANNE BEHM is an inventory management specialist in the DFSC Directorate of Supply Operations.

Fuel Line Gleanings . . .

In a speech to the National Press Club, Secretary of Energy **James B. Edwards** emphasized his managerial commitment to filling the Strategic Petroleum Reserve and to satisfying energy-related defense requirements.

* * *

Birney Morse, tabbed as the architect of the World War II Himalayan pipeline, has passed away at the age of 81. Morse, a 1923 graduate of West Point, created a pipeline that earned him the title "the man who repealed the law of gravity" because it often ran vertically with drops and rises of as much as 10,000 feet. His World War II pipeline carried high-octane aviation fuel to the China-Burma-India Theater. Following the war, he served as the Chief American project engineer on the NATO pipeline.

* * *

The **Department of Energy** has agreed to fund 80 percent of a $6-million coal gasification project in Utah. The 30-month project will test a new system for converting coal into synthetic gas that could be used either as a fuel or a petrochemical feedstock.

* * *

England's **Queen Elizabeth** officially opened the **Sullom Voe** oil terminal which was constructed at a cost of $2.5 billion. The terminal is Europe's biggest and is capable of handling two-thirds of Britain's North Sea oil output. It can accommodate up to 20 tankers a week.

* * *

A four-hour test flight of the **air-launched cruise missile** proved that the missile's special JP-10 high-density, high performance fuel performs as expected. **JP-10,** an aviation turbine fuel, is blended to endure harsh weather conditions and long periods of storage. The fuel will be standard in all air-launched cruise missiles.

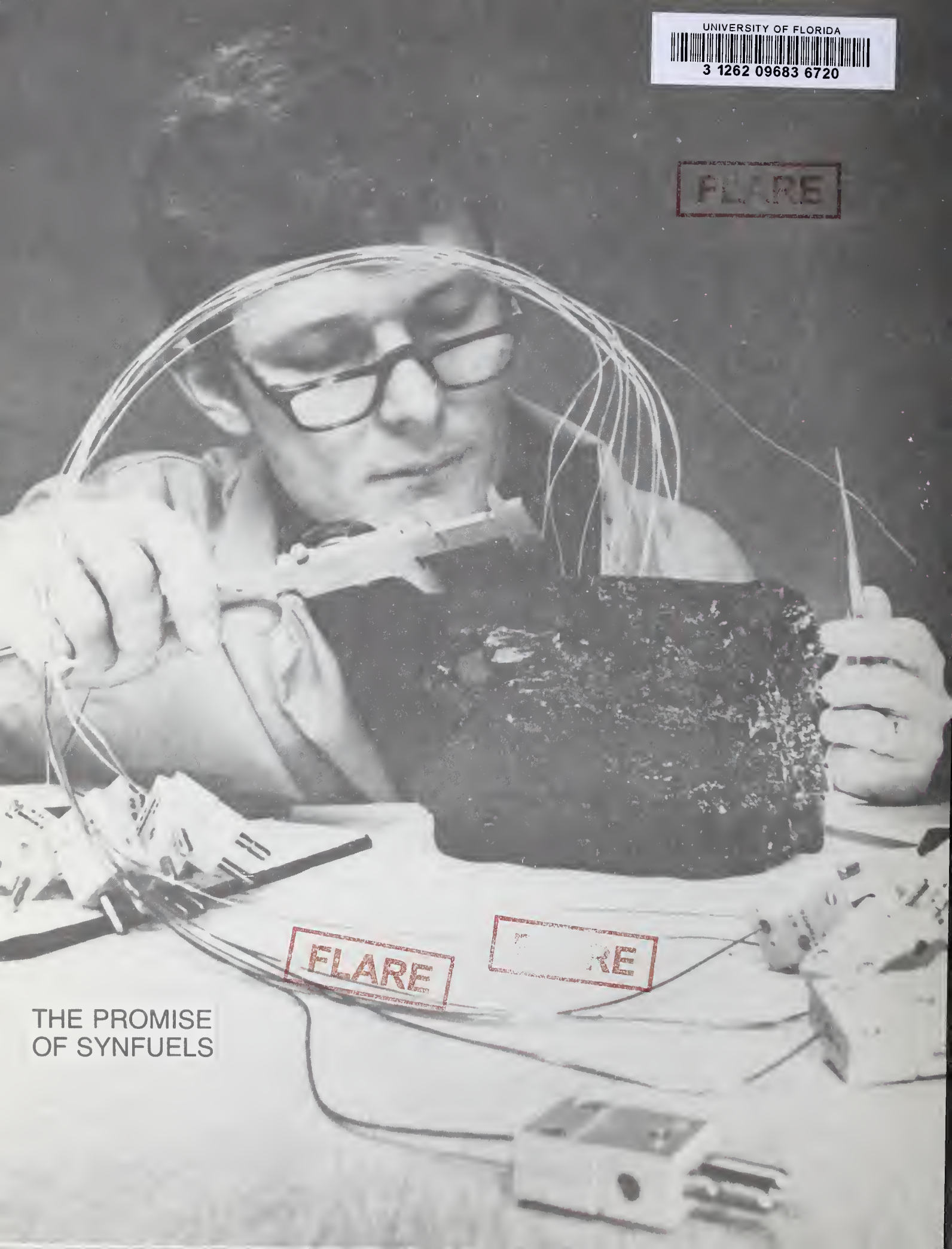
* * *

Plans for building a $1.4-billion **coal liquefaction plant** at Morgantown, West Virginia were dropped after a two-day meeting between negotiators from the American, Japanese, and West German companies involved in the project. The project was to be 50 percent funded by the Department of Energy, with West Germany and Japan each paying 25 percent of the costs. The decision to terminate the project was made because of steeply rising costs.

* * *

Earlier this fall, a key milestone in the nation's **Strategic Petroleum Reserve** was reached when the 200 millionth barrel of crude was delivered to the Reserve at the St. James Terminal. The more than 200 million barrels that have been delivered to the Reserve represent about 40 days of crude oil imports at the current U.S. import rate. **FL**

*U.S. GOVERNMENT PRINTING OFFICE: 1981-0-361-521/235



THE PROMISE OF SYNFUELS